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## Neural Network Applications in Earthquake Prediction (1994-2019): Meta-Analytic & Statistical Insights on their Limitations

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In the last few years, deep learning has solved seemingly intractable problems, boosting the hope to find approximate solutions to problems that now are considered unsolvable. Earthquake prediction, the Grail of Seismology, is, in this context of continuous exciting discoveries, an obvious choice for deep learning exploration. We reviewed the literature of artificial neural network (ANN) applications for earthquake prediction (77 articles, 1994-2019 period) and found two emerging trends: an increasing interest in this domain over time, and a complexification of ANN models towards deep learning. Despite the relatively positive results claimed in those studies, we verified that far simpler (and traditional) models seem to offer similar predictive powers, if not better ones. Those include an exponential law for magnitude prediction, and a power law (approximated by a logistic regression or one artificial neuron) for aftershock prediction in space. Due to the structured, tabulated nature of earthquake catalogues, and the limited number of features so far considered, simpler and more transparent machine learning models than ANNs seem preferable at the present stage of research. Those baseline models follow first physical principles and are consistent with the known empirical laws of Statistical Seismology (e.g. the Gutenberg-Richter law), which are already known to have minimal abilities to predict large earthquakes.